TRAINING PROGRAM OF INSTRUCTION (TPI)

FOR

DINFOS-BTVEM

BASIC TELEVISION EQUIPMENT MAINTENANCE COURSE

(DINFOS-BTVEM-USA)
(DINFOS-BTVEM-USAF)

Approved by:

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Colonel, U. S. Army
Commandant
Defense Information School

Approval Date:

Supersedes TPI dated June 1999

BASIC TELEVISION EQUIPMENT MAINTENANCE COURSE

TRAINING PROGRAM OF INSTRUCTION

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TRAINING PROGRAM OF INSTRUCTION

Preface

TRAINING PROGRAM OF INSTRUCTION FILE NUMBER (TPFN): DINFOS-BTVEM

UNIT TITLE: Basic Television Equipment Maintenance Course

TRAINING LOCATION: Defense Information School, Fort George G. Meade, Maryland

SPECIALTY AWARDED: USA MOS 25R10
USAF AFSC 2E1X4

PURPOSE: To identify the training requirements for award of the aforementioned occupational specialties. This document provides a summary of the training objectives and activities used to fulfill the Service's mandated knowledge and performance skill competencies to be experienced and achieved by each student in order to successfully complete this course.

COURSE DESCRIPTION: This course provides instruction on the basic concepts of operation, fundamental maintenance, and repair skills for all aspects of television systems. This includes practical hands-on training in the use of test equipment, troubleshooting and repair of monitors, receivers, television cameras, videotape recorders, audio systems, broadcast studio and transmission systems. This course is primarily designed for entry-level service members and is an MOS/AFSC assigning course. This TPI satisfies all requirements for BTVEM-USA and BTVEM-USAF.

PREREQUISITES:

US Army: E1 through E6, minimum EL score of 110 on the ASVAB; be a graduate of Electronic Fundamentals Course (DINFOS); have normal color vision; profile series: PUHLES 212221; cannot experience acrophobia, claustrophobia, or vertigo; and be able to lift 75 lbs.

US Air Force: E1 through E7, 2E1X4, high school graduate with completion of courses in algebra, geometry, trigonometry, and physics is desirable; ASVAB electronics 67 percentile; completed Electronic Principles Training (Keesler); be able to lift 50 lbs.; profiles series PUHLES 333233, and have normal color vision IAW AFI 48-123.

Target population/prerequisite(s) waiver requests must come through the requesting Service's career field manager to the Commandant, DINFOS for approval.

International students attending this course must have an English Comprehension Level (ECL) of 80. Must have normal color vision, cannot have acrophobia, be claustrophobic, or have vertigo. Must have completed DINFOS EFC course prior to attending the BTVEM course.

SECURITY CLEARANCE: None

CLASS SIZE:

MAXIMUM: 8

MINIMUM: 4

ANNUAL COURSE CAPACITY: 128

COURSE LENGTH: 87 training days.

ACADEMIC HOURS: 681

ADMINISTRATIVE HOURS: 15

TOTAL COURSE HOURS: 696

INSTRUCTOR CONTACT HOURS: 1083

TYPE/METHOD OF INSTRUCTION:	**HOURS:**
ADMINISTRATIVE (AD):	15 Hrs
CONFERENCE/LECTURE (CL):	261.5 Hrs
DEMONSTRATION (D)	40.75 Hrs
PERFORMANCE EXERCISE (PE):	257.75 Hrs
PERFORMANCE EXAMINATION (EP):	90 Hrs
WRITTEN EXAMINATION (EW):	31 Hrs

TRAINING START DATE: March 2006

ENVIRONMENTAL IMPACT: None. DoD policy was followed to assess the environmental impact.

MANPOWER: The Interservice Training Review Organization (ITRO) formula was used to determine the number of instructors required.

EQUIPMENT AND FACILITIES: The Course Design Resource Estimate (CDRE) contains this information.

TRAINING DEVELOPMENT PROPONENT: Defense Information School, Course Development Department, (301) 677-3272; DSN 622-3273

FUNCTIONAL AREA 1
Fundamentals of Television

TPFN: DINFOS-BTVEM-001-001-

UNIT TITLE: Safety (OSHA standards)

TPFN TYPE AND HOURS: 3 L; 1 EW

TPFN TOTAL HOURS: 4

PREREQUISITE TPFN: None

TASK(S): 001 Identify:
Personal risks to include radiation hazard standard.
Environmental and HAZMAT considerations.
Electrical and equipment safety.

TRAINING OBJECTIVE: Given extracts from the Occupational Safety and Health Administration's (OSHA) regulations/guidelines and the DoD radiation hazard standard (included in student handout), the student identifies the dangers associated with radiation and electrical current to personal and equipment safety, the dangers of hazardous materials (HAZMAT) to personnel and the environment, and the OSHA and DoD standards of safety in the workplace. Comprehension is measured with written evaluations. The student must correctly answer at least 70 percent of the questions for each objective. The student will also demonstrate the ability to apply these safety principles throughout the entire BTVEM Course during all daily classroom activities, including practice performances, performance evaluations, and examinations.

REFERENCES: Student study guide
OSHA 29 CFR
www.OSHA.gov

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 1
Fundamentals of Television

TPFN: DINFOS-BTVEM-001-002-

UNIT TITLE: General Repair Considerations

TPFN TYPE AND HOURS: 2.5 L; 1 EW

TPFN TOTAL HOURS: 3.5

PREREQUISITE TPFN: None

TASK(S): 001 Identify corrosion control fundamentals.

TRAINING OBJECTIVE: Given a list of terms and partial definitions, the student identifies various types of corrosion and their causes; selects control methods used to prevent and treat corrosion; identifies proper electronic equipment grounding techniques, how to detect grounding problems, and the consequences that arise from improper grounding. Comprehension is measured using written evaluations. To complete each objective, the student must answer 70 percent of all questions correctly.

REFERENCES: Student study guide and student handouts
TMs/TOs
www.OSHA.gov

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 1
Fundamentals of Television

TPFN: DINFOS-BTVEM-001-003-

UNIT TITLE: Basic Principles of Television/Radio

TPFN TYPE AND HOURS: 27 L; 1 EW

TPFN TOTAL HOURS: 28

PREREQUISITE TPFN: None

TASK(S): 001 Identify basic principles of analog video signal, digital video signal, and audio signal (analog/digital).

TRAINING OBJECTIVE: Given information about, or a sample of video and/or audio signals, the student describes the basic concepts of composite video; the theories and identifiable characteristics of deflection and scanning, analog video, colorimetry, digital video, and analog/digital audio in accordance with National Television Systems Committee (NTSC) standards; digital signal processing, including the differences and similarities of component and composite digital video signals. Emphasis is placed on analog video, as the student must achieve a firm comprehension of those essential concepts and characteristics. This information is necessary to assure student success, as it is referenced extensively with later instruction in monitor, receiver, and television camera functional areas. During the analog video objective, quizzes are given frequently to determine if the student is progressing. The quiz grades do not satisfy the written examination requirements. Student competency is measured using written evaluations. To complete each objective, the student must answer 70 percent of all questions correctly. The student also applies this knowledge throughout the entire BTVEM Course during all classroom activities, including practice performances, performance exercises, and examinations.

REFERENCES: Student study guide and handouts (Basic Television and Video Systems)
NAB Engineer Book 9th Edition, pages 69-77, 82-84, 93-95, 268-469, 329-335, 675, 1152, 1163, 960, 1120, 1140, 1339, 1371
VCR and Assorted Tapes, Analog Videos
Basic Television and Video System, 6th Edition Bernard Grob
Pages 38-61, 184-206, 308-326

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 1
Fundamentals of Television

TPFN: DINFOS-BTVEM-001-004-

UNIT TITLE: Basic Principles of Transmission

TPFN TYPE AND HOURS: 3L; 1 EW

TPFN TOTAL HOURS: 4

PREREQUISITE TPFN: None

TASK(S): 001 Identify RF transmission theory (AM/FM/TV).

TRAINING OBJECTIVE: Given a list of terms and definitions, the student identifies frequency allocations in the radio frequency (RF) spectrum, and technical components and characteristics of transmitting AM/FM/TV signals. Each student must achieve a firm comprehension of the TV transmission theory prior to entering the monitor functional area. The student participates in a guided discussion on the different types and characteristics of antenna systems. The student is also introduced to different types of data transmission and reception, and the fundamentals of a studio transmitter link. Comprehension of subject material is measured using written examinations. The student must correctly answer at least 70 percent of the questions for each objective. The student also applies this knowledge to demonstrate performance competencies throughout the monitor, studio, and transmission functional areas of the BTVEM Course.

REFERENCES: Student study guide and handouts
www.FCC.org
NAB Engineer Book 9th Edition, Pages 6-29, 321, 525-543, 406-407, 475-476, 802-804
Basic Television ad Video System, 6th Edition Bernard Grob
Pages 410-442

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 1
Fundamentals of Television

TPFN: DINFOS-BTVEM-001-005-

UNIT TITLE: Troubleshooting

TPFN TYPE AND HOURS: 5 L; 1 EW

TPFN TOTAL HOURS: 6

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Identify principles of troubleshooting, using block diagrams, component diagrams, schematics, and logic diagram flow charts.

TRAINING OBJECTIVE: Given block diagrams, component diagrams, schematics, and logic diagram flow charts, the student identifies troubleshooting steps, signal and component locations, and board functions of a sample piece of broadcast equipment. Comprehension of subject material is measured with performance/written examinations. To satisfactorily pass each objective, students must correctly answer at least 70 percent of the questions and problems. The student also applies this knowledge to demonstrate performance competencies throughout the rest of the BTVEM Course.

REFERENCES: Camera schematics
Camera block diagrams
TMs/TOs

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 1
Fundamentals of Television

TPFN: DINFOS-BTVEM-001-006-

UNIT TITLE: Video Measurements

TPFN TYPE AND HOURS: 4 D; 2 PE; 23 EP

TPFN TOTAL HOURS: 29

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Use test equipment for video measurements of:
waveform monitor, vectorscope, oscilloscope, video test signal generator, digital multimeter, analog multimeter, and frequency counter.

TRAINING OBJECTIVE: Given each piece of test equipment listed above, a sample piece of broadcast equipment, a signal generator, and Manufacturer's manuals, the student measures the composite video signals, basic electronic signals, and electronic component values. Student competency is measured using performance evaluations. Each student must demonstrate proficiency by successfully completing individual performance evaluations in accordance with criteria developed from the Manufacturer's manual for the purpose and use of each diagnostic tool. The student also applies this knowledge to demonstrate performance competencies throughout the rest of the BTVEM Course.

REFERENCES: All Test Equipment Manuals
Manufacturer's Manual/Vectorscope
Manufacturer's Manual/Waveform Monitor
Manufacturer's Manual/Digital Multimeter
Manufacturer's Manual/Analog Multimeter
Manufacturer's Manual/Oscilloscope
Manufacturer's Manual/Video Test Signal Generator
Manufacturer's Manual/Frequency Counter

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 1
Fundamentals of Television

TPFN: DINFOS-BTVEM-001-007-

UNIT TITLE: Future of Broadcast Television

TPFN TYPE AND HOURS: 1 L; .5 EW

TPFN TOTAL HOURS: 1.5

PREREQUISITE TPFN: None

TASK(S): 001 Access new technology initiatives.

TRAINING OBJECTIVE: Through guided lecture and research, the student will discuss and identifies emerging technologies. Comprehension of subject material is measured using a written evaluation. To satisfactorily pass this objective, each student must correctly answer at least 70 percent of the questions on the written examination.

REFERENCES: Student study guide and handouts
www.FCC.org
NAB Engineer Book 9th Edition,
Basic Television ad Video System, 6th Edition Bernard Grob

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 2
Computer Embedded Systems

TPFN: DINFOS-BTVEM-002-001-

UNIT TITLE: Basic Computer Functions

TPFN TYPE AND HOURS: 14 L; 1 EW

TPFN TOTAL HOURS: 15

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Identify basic computer (PC) principles to include input/output devices, video card functions, audio card functions, drives/storage device functions, and software functions.

TRAINING OBJECTIVE: Given a micro-computer (desktop-sized) the student will explain the functions of software, video cards, audio cards, drives/storage devices, operating systems and input/output devices; local area net/wide area net (LANs/WANs). Comprehension is measured by written examination. The student must answer at least 70 percent of the questions for practical knowledge objectives. Students must also be able to perform an operations check, assemble a PC, and troubleshoot to board level and perform protocol analysis without error.

REFERENCES: PC Repair & Upgrade, Scott Mueller, QUE
New Inside the PC 2002, Peter Norton/Scott Clark, SAMS
How computers work, 6th Edition, 2001

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 2
Computer Embedded Systems

TPFN: DINFOS-BTVEM-002-002-

UNIT TITLE: Network Fundamentals

TPFN TYPE AND HOURS: 2 L; .5 EW

TPFN TOTAL HOURS: 2.5

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Identify principles of LAN/WAN.

TRAINING OBJECTIVE: Students will identify principles of a LAN/WAN to include terminologies, types of computer networks, networking concepts and capabilities/limitations. Students must score 70% of the questions on a written examination.

REFERENCES: PC Repair & Upgrade, Scott Mueller, QUE
New Inside the PC 2002, Peter Norton/Scott Clark, SAMS
How computers work, 6th Edition, 2001

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 2
Computer Embedded Systems

TPFN: DINFOS-BTVEM-002-003-

UNIT TITLE: PC Maintenance

TPFN TYPE AND HOURS: 1 D; 16 PE; 2 EP

TPFN TOTAL HOURS: 19

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Assemble, load operating systems, perform protocol analysis perform operational check, and troubleshoot computer system to sub-assembly.

TRAINING OBJECTIVE: Students will assemble, load operating system, perform protocol analysis, perform an operational check and troubleshoot/identify an instructor-inserted malfunction in the PC to the sub-assembly level IAW Manufacturer's manuals, with no safety violations, within two hours, and the tolerances defined in PE 007-003-001.

REFERENCES: Manufacturer's Manual/PC
Manufacturer's Manual/Protocol analyzer
PC Repair & Upgrade, Scott Mueller, QUE

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 2
Computer Embedded Systems

TPFN: DINFOS-BTVEM-002-004-

UNIT TITLE: Troubleshooting

TPFN TYPE AND HOURS: .5 D; 3.5 PE; 1 EP

TPFN TOTAL HOURS: 5

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Troubleshoot network to assembly levels.

TRAINING OBJECTIVE: Students will perform an operational check, then troubleshoot and identify an instructor-inserted malfunction in the network to the assembly level IAW the Manufacturer's manuals, with no safety violations, within one hour, and within the tolerances defined I on the performance checklist, PE 007-004-001.

REFERENCES: PC Repair & Upgrade, Scott Mueller, QUE
How computer work, 6th Edition, 2001

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 2
Computer Embedded Systems

TPFN: DINFOS-BTVEM-002-005-

UNIT TITLE: Computer Systems (Macintosh):

TPFN TYPE AND HOURS: 4.5 L; 1 EW; .5 D; 1 PE; .5 EP

TPFN TOTAL HOURS: 7.5

PREREQUISITE TPFN: All previous TPFNs

TASK(S):
001 Identify basic computer principles and concepts.
002 Identify input / output devices.
003 Load operating system.

TRAINING OBJECTIVE: Given a Macintosh desktop computer, student will identify Macintosh computer concepts, input/output devices, and understand the functions of an operating system. Comprehension is measured by written exam and student must answer at least 70 percent of the questions correctly for each exam. Students will also load an operating system IAW the Manufacturer's manuals.

REFERENCES: How Macs Work, 6th Edition, John Rizzo/Daniel Clark Ziff-Davis

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW, D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 2
Computer Embedded Systems

TPFN: DINFOS-BTVEM-002-006-

UNIT TITLE: Non-Linear Editing.

TPFN TYPE AND HOURS: 2.5 L; .5 EW; 1 D; 10 PE; 1 EP

TPFN TOTAL HOURS: 15

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Identify principles of non-linear editing.
002 Operate a non-linear editing system.

TRAINING OBJECTIVE: Given a non-linear editing system and Manufacturer's technical manuals, the student will define and perform selected functions of non-linear editing. Competency for task 001 is measured by written exam and student must correctly answer at least 70 percent of the questions correctly. Task 002 must be performed without error IAW Manufacturer's technical manuals.

REFERENCES: AVID manufacturer's manual for operations and maintenance
AVID Express DV manual

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW) 1:4 (D, EP, PE)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 3
Monitors and Receivers

TPFN: DINFOS-BTVEM-003-001-

UNIT TITLE: Monitor Operations

TPFN TYPE AND HOURS: 13 L; 3 EW; 1 D; 6 PE; 2 EP

TPFN TOTAL HOURS: 25

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Identify principles using manufacturer's diagrams.
002 Use radio frequency signal generator.
003 Perform operational check.

TRAINING OBJECTIVE: Given a television monitor and appropriate diagrams, as listed above, the student identifies the signal path through the monitor's cathode ray tube (CRT). The student also analyzes monitor operations to identify the signal types and levels present at various points in the monitor. The student must correctly answer at least 70 percent of the questions on the written examination of each objective.

REFERENCES: Manufacturer's Manual/Monitor with block diagrams and schematics
Manufacturer's Manual/Oscilloscope
Manufacturer's Manual/Radio Freq
Manufacturer's Manual/Digital Multimeter

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW) 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 3
Monitors and Receivers

TPFN: DINFOS-BTVEM-003-002-

UNIT TITLE: Circuit Checks

TPFN TYPE AND HOURS: 1 D; 13 PE; 1.5 EP

TPFN TOTAL HOURS: 15.5

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Perform operational check of power supply circuits, deflection circuits, and voltage circuits.

TRAINING OBJECTIVE: Given a TV monitor, alignment tools, appropriate test and measurement equipment, and Manufacturer's technical manuals, the student aligns each of the circuits listed above in accordance with the Manufacturer's guidelines as listed in the technical manuals. The student is required to demonstrate proficiency by satisfactorily completing the alignments to industry standards as extracted from Manufacturer's technical manuals.

REFERENCES: Manufacturer's Manual/Oscilloscope
Manufacturer's Manual/Radio Freq
Manufacturer's Manual/Digital Multimeter
Manufacturer's Manual/Monitor block diagrams and schematics

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 3
Monitors and Receivers

TPFN: DINFOS-BTVEM-003-003-

UNIT TITLE: Receivers

TPFN TYPE AND HOURS: 15.5 L; 1 EW

TPFN TOTAL HOURS: 16.5

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Identify principles of receiver operations.

TRAINING OBJECTIVE: Given a TV receiver and its technical manual, block diagrams, circuit diagrams, and circuit component diagrams and listings, the student identifies operational defects of a TV receiver by tracing signals through the various circuits. Primary emphasis is placed on identification of a defective circuit component. Comprehension of subject material is measured using written evaluations. The student must correctly answer at least 70 percent of the questions for each objective.

REFERENCES: Manufacturer's Manual/Receiver block diagrams and schematics

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 3
Monitors and Receivers

TPFN: DINFOS-BTVEM-003-004-

UNIT TITLE: Receiver Operation and Circuit Checks

TPFN TYPE AND HOURS: .5 D; 3 PE; 2 EP

TPFN TOTAL HOURS: 5.5

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Perform operational check on receiver, to include checking power supply circuits, aligning deflection circuits, aligning high-voltage circuits, and aligning convergence circuits.

TRAINING OBJECTIVE: Given a TV receiver, alignment tools, test equipment, and Manufacturer's manual, the student performs an operational check on the receiver, checks the power supply circuits, and aligns the circuits listed above in accordance with the Manufacturer's technical manuals and verified by correct operation of the receiver. The student is required to demonstrate proficiency of the circuit checks and alignments without error, in accordance with criteria extracted from the Manufacturer's technical manuals, but may receive two instructor assists (a student's question or uncertainty of how to proceed is answered by the instructor). An observation of a safety violation results in a student being required to retest.

REFERENCES: Manufacturer's Manual/Oscilloscope
Manufacturer's Manual/Radio Freq
Manufacturer's Manual/Digital Multimeter
Manufacturer's Manual/Receiver with block diagrams and schematics

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 3
Monitors and Receivers

TPFN: DINFOS-BTVEM-003-005-

UNIT TITLE: Troubleshooting

TPFN TYPE AND HOURS: .5 D; 15 PE; 2 EP

TPFN TOTAL HOURS: 17.5

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Troubleshoot monitors to component level.

TRAINING OBJECTIVE: Given a monitor, receiver, radio frequency signal generator, oscilloscope, multimeter, high voltage probe, associated test cables and Manufacturer's manuals, students will troubleshoot and identify the malfunction to the component level IAW Manufacturer's manuals, with no safety violations, within one hour as defined on the performance checklist.

REFERENCES: Manufacturer's Manual/Oscilloscope
Manufacturer's Manual/Radio Freq
Manufacturer's Manual/Digital Multimeter
Manufacturer's Manual/Receiver with block diagrams and schematics

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 4
Television Camera Basics

TPFN: DINFOS-BTVEM-004-001-

UNIT TITLE: Television Camera Basics

TPFN TYPE AND HOURS: 30 L; 2 EW

TPFN TOTAL HOURS: 32

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Identify basic principles of television cameras, to include optical systems charge coupled device (CCD), digital signal processing, power supply board, sync generator board, video amplifier board, processor board, and encoder board.

TRAINING OBJECTIVE: Students describe theory, structure, and operations of various lens assemblies and CCDs. Given a broadcast quality video camera and Manufacturer's manual, the student describes the fundamental concepts and components of camera optical systems, the basic principles and characteristics of images, and traces signals through the power supply, sync generator, video amplifier board, processor board and encoder. Comprehension is measured with a written evaluation. The student must correctly answer at least 70 percent of the questions for each objective.

REFERENCES: Charged Coupled Devices and related boards to camera operation published by Sony Business and Professional Group, Ian Sheldon
Sony DXC-D30L, Service Manual, Vol. 1 1st Edition, Published by Sony Business and Professional Group

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 4
Television Camera Basics

TPFN: DINFOS-BTVEM-004-002-

UNIT TITLE: Television Camera Operation

TPFN TYPE AND HOURS: 1.5 D; 5 PE; 1.5 EP

TPFN TOTAL HOURS: 8

PREREQUISITE TPFN: All previous TPFNs

TASK(S):
001 Remove and replace lens assembly.
002 Adjust back focus and tracking.
003 Perform an operational check.

TRAINING OBJECTIVE: Given a camera, appropriate test equipment, and the Manufacturer's technical manual, the student removes and replaces the lens assembly, adjusts back focus and tracking, and conducts an operational check in accordance with the Manufacturer's technical manual. The student demonstrates proficiency by removing and replacing the lens assembly without error, then performs a mechanical back focus adjustment. Students perform an operational check of the camera IAW the Manufacturer's technical manual without error or safety violation.

REFERENCES: Manufacturer's Manual/Camera block diagrams and schematics
Manufacturer's Manual/Oscilloscope
Manufacturer's Manual/Light box
Manufacturer's Manual/Digital Multimeter
Manufacturer's Manual/Waveform monitor
Manufacturer's Manual/Vectorscope
Manufacturer's Manual/Camera

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 4
Television Camera Basics

TPFN: DINFOS-BTVEM-004-003-

UNIT TITLE: Television Camera Alignments

TPFN TYPE AND HOURS: 3.5 D; 17.5 PE; 3 EP

TPFN TOTAL HOURS: 24

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Perform operational test of power supply board, align video pre-ampflier, video ampflier board, shading circuits, gamma circuits, encoder circuits, and interface circuits.

TRAINING OBJECTIVE: Given a camera and Manufacturer's technical manual, the student identifies the principles of the television camera system and the alignments required for proper camera set-up. The students demonstrate proficiency by aligning the circuits without error. The alignments enhance the knowledge-based instruction for a total understanding of the camera

REFERENCES: Manufacturer's Manual/Camera block diagrams and schematics
Manufacturer's Manual/Oscilloscope
Manufacturer's Manual/Light box
Manufacturer's Manual/Digital Multimeter
Manufacturer's Manual/Waveform monitor
Manufacturer's Manual/Vectorscope
Manufacturer's Manual/Camera

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 4
Television Camera Basics

TPFN: DINFOS-BTVEM-004-004-

UNIT TITLE: Television Camera Repair.

TPFN TYPE AND HOURS: 1 D; 13 PE; 2 EP

TPFN TOTAL HOURS: 16

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Troubleshoot to card level.

TRAINING OBJECTIVE: Given a camera, test equipment, alignment tools, and the Manufacturer's technical manual, the student troubleshoots the camera to identify malfunctions to the card level. Performance measurement and evaluation is based on task completion without error, allowing up to one instructor assist, and no safety violations.

REFERENCES: Manufacturer's Manual/Camera block diagrams and schematics
Manufacturer's Manual/Oscilloscope
Manufacturer's Manual/Light box
Manufacturer's Manual/Digital Multimeter
Manufacturer's Manual/Waveform monitor
Manufacturer's Manual/Vectorscope
Manufacturer's Manual/Camera

INSTRUCTOR/STUDENT RATIO: 1:4 (D, EP, PE)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 5
Audio

TPFN: DINFOS-BTVEM-005-001-

UNIT TITLE: Audio Concepts

TPFN TYPE AND HOURS: 1. 5 L; .5 EW

TPFN TOTAL HOURS: 2

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Identify concepts of audio systems.

TRAINING OBJECTIVE: Given an audio studio with various recording, playback, storage, amplification, processing, monitoring devices, and block diagrams of said devices, the student describes the path of the audio signal through the various devices and identifies the functions of each device. Comprehension of subject material is measured using written examinations in which the student must correctly answer at least 70 percent of the questions.

REFERENCES: Elements of Radio 6th Edition by Abraham Marcus and William Marcus
Page 680-681

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 5
Audio

TPFN: DINFOS-BTVEM-005-002-

UNIT TITLE: Audio (Analog)

TPFN TYPE AND HOURS: 10 L; 1 EW

TPFN TOTAL HOURS: 11

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Identify principles of analog audio to include frequency response, impedance matching, signal-to-noise ratio, balanced and unbalanced signals, pre-emphasis/de-emphasis, signal grounding, connector types, stereo (phasing), and microphones (types and uses).

TRAINING OBJECTIVE: Students must correctly identify the characteristics of analog audio. Given different types of microphones and other selected pieces of audio equipment that have differing input and output specifications, the student defines the terms listed above; chooses the correct type of microphone to use in different environments; and describes the effects various environmental conditions have on producing or reproducing audio. Comprehension of subject material is measured using written examinations in which the student must correctly answer at least 70 percent of the questions.

REFERENCES: NAB page 246, 275-320, 399-401, 455-456, 1368
2E1X4 Careers Development Course: Basic Electronics 10:5, 14:08, 18, 20:11, 23:13, 23:14
"Performance" Technical Notes at www.Proformance.net

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 5
Audio

TPFN: DINFOS-BTVEM-005-003-

UNIT TITLE: Test and Measurement Equipment

TPFN TYPE AND HOURS: .5 D; 2.5 PE; 1 EP

TPFN TOTAL HOURS: 4

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Use audio test and measurement equipment.

TRAINING OBJECTIVE: Given audio signal generator, an audio analyzer, oscillators, and Manufacturer's technical manuals, the student connects the pieces of test equipment to each other, produces selected audio signals, analyzes those signals for proper output criteria, and diagnoses faulty equipment based on the signals produced. Comprehension of subject material will be measured using performance evaluations. The student must correctly use a test signal generator, analyze signals on the audio analyzer, and diagnose programmed faulty signals without error or safety violation.

REFERENCES: Manufacturer's manual/Audio Analyzer
Manufacturer's manual, Audio Generator
NAB, pages 1367-1380

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 5
Audio

TPFN: DINFOS-BTVEM-005-004-

UNIT TITLE: Principles of Audio II (Digital)

TPFN TYPE AND HOURS: 2 L; 1 EW

TPFN TOTAL HOURS: 3

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Identify principles of digital audio to include the characteristics of analog vs. digital.

TRAINING OBJECTIVE: Given a list of terms, the student will correctly identify the characteristics of digital audio. The student will also correctly identify modes of compression used with various types of audio technology. Comprehension is measured with a written examination. The student must correctly answer at least 70 percent of the questions.

REFERENCES: NAB, page 1367-1380
ASG 100 Operations manual

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 5
Audio

TPFN: DINFOS-BTVEM-005-005-

UNIT TITLE: Compact Disc Decks

TPFN TYPE AND HOURS: .5 D; 1 PE; .5 EP

TPFN TOTAL HOURS: 2

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Perform operational check of compact disc decks.

TRAINING OBJECTIVE: Students must correctly identify the principles of compact disk playback. Given the manufacturers technical manual, the student must successfully perform an operational check and clean the CD player. The student must also align the CD player IAW Manufacturer's guidelines. . Proficiency is measured by a performance examination. The student must perform the task IAW the Manufacturer's guidelines and with no safety violations.

REFERENCES: Manufacturer's manual, Denon CD player Operation manual 951-FA

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 5
Audio

TPFN: DINFOS-BTVEM-005-006-

UNIT TITLE: Maintenance of Recording Systems

TPFN TYPE AND HOURS: 3 L; 1 EW; 1 D; 3.5 PE; 1.5 EP

TPFN TOTAL HOURS: 10

PREREQUISITE TPFN: All previous TPFNs

TASK(S):
001 Identify magnetic recording principles.
002 Identify analog cassette / DAT / MD principles.
003 Perform analog cassette / DAT / MD operational checks.
004 Demagnetize heads and lubricate tape paths.

TRAINING OBJECTIVE: Students must correctly identify the principles of magnetic recording. Students must also be able to identify the principles of analog cassette, digital audiotape and mini disk recording systems. The student must successfully perform an operational check IAW the Manufacturer's manual. Comprehension is measured using written and performance evaluations. The student must correctly answer at least 70 percent of the questions on the written evaluation. Additionally, the student must perform an operations check, and demagnetize heads/lubricate tape paths on a recording system with no errors or safety violations IAW the Manufacturer's guidelines.

REFERENCES: NAB, page 335-338, 896-906
2E1X4 Careers Development Course: Basic Electronics 12:07
Complete Guide to Digital Audio Tape by Delton T. Horn
Taskcam 122MK III page 6-15
Sony PCM-7010 page 2-4 thru 4-19
Sony MDS-B5 page 2-1 thru 5-3

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW); 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 5
Audio

TPFN: DINFOS-BTVEM-005-007-

UNIT TITLE: Audio Distribution Systems

TPFN TYPE AND HOURS: 1.5 L; 1.5 D; 4 PE; 2.5 EP; .5 EW

TPFN TOTAL HOURS: 10

PREREQUISITE TPFN: All previous TPFNs

TASK(S):
001 Identify principles of operation.
002 Perform operational checks.
003 Align audio distribution system.
004 Troubleshoot to board level.

TRAINING OBJECTIVE: Given an audio console, audio equalizers, all appropriate test equipment, and Manufacturer's technical manuals; the student identifies the features and operating functions of the audio distribution system. The student then performs an operations check and alignment, and troubleshoots the audio distribution system. Comprehension of task 001 is measured with a written examination. The student must correctly answer at least 70 percent of the questions for this task. Comprehension of tasks 002 – 004 is measured with performance evaluations. The student must perform tasks 002 - 004 in accordance with Manufacturer's guidelines and with no safety violations.

REFERENCES: Technical Manual: Grass Valley Distribution Amps, 210 Mixer

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW); 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 5
Audio

TPFN: DINFOS-BTVEM-005-008-

UNIT TITLE: Audio Consoles

TPFN TYPE AND HOURS: 1.5 L; 1.5 D; 10.5 PE; 3 EP; .5 EW

TPFN TOTAL HOURS: 17

PREREQUISITE TPFN: All previous TPFNs

TASK(S):
001 Identify principles of operation.
002 Perform operational checks.
003 Align.
004 Troubleshoot to board level.

TRAINING OBJECTIVE: Given an audio console, audio equalizers, all appropriate test equipment, and Manufacturer's technical manuals, the student identifies the features and operating functions of the console and the equalizer; performs an operations check and alignment of the console and the equalizer; and troubleshoots the console and equalizer. Comprehension of task 001 is measured with a written examination. The student must correctly answer at least 70 percent of the questions for each task. Comprehension of tasks 002 – 004 is measured with performance evaluations. The student must perform tasks 003 and 004 in accordance with Manufacturer's guidelines and with no safety violations. The student must perform task 004 by correctly identifying the problem down to the board level and with no safety violations.

REFERENCES: Manufacture's Operation and Maintenance Manual: Audiotronics Series 210
Manufacturer's Manual/Audio analyzer
Manufacturer's Manual/Audio generator

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW); 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 5
Audio

TPFN: DINFOS-BTVEM-005-009-

UNIT TITLE: Audio Studio

TPFN TYPE AND HOURS: .5 D; 9.5 PE; 2 EP

TPFN TOTAL HOURS: 12

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Troubleshoot audio studio.

TRAINING OBJECTIVE: Given an audio console, audio analyzer, audio generator, associated test cables and Manufacturer's manuals, students will troubleshoot and identify a malfunction in an audio studio to board level IAW the Manufacturer's manuals, with no safety violations, and as defined on the performance checklist.

REFERENCES: Manufacturer's Operation and Maintenance Manual: Audiotronics Series 210
Manufacturer's Manual/Audio analyzer
Manufacturer's Manual/Audio generator

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 5
Audio

TPFN: DINFOS-BTVEM-005-010-

UNIT TITLE: Audio Automation

TPFN TYPE AND HOURS: 5.5 L; .5 EW; 1 D; 6 PE; 2 EP;

TPFN TOTAL HOURS: 16

PREREQUISITE TPFN: All previous TPFNs

TASK(S):
001 Identify principles of operation.
002 Perform an operational check.
003 Mid-course survey (1 Admin hour)

TRAINING OBJECTIVE: Students must correctly answer a minimum of 70% of the questions contained within KE 007-007-001, Version A or B, within 30 minutes. Students will perform an operational check of audio automation systems IAW Manufacturer's manuals, with no safety violations, within 30 minutes and the tolerances defined in the performance checklist.

REFERENCES: Manufacturer's Manual/Audiovault

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW); 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 6
Video Tape Recorders (VTR)

TPFN: DINFOS-BTVEM-006-001-

UNIT TITLE: Video Tape Recorders (VTR)

TPFN TYPE AND HOURS: 50 L; 2 EW

TPFN TOTAL HOURS: 52

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Identify principles of VTRs to include analog VTRs, digital VTRs, mechanical circuits, servo circuits, video/RF circuits, audio circuits, and removal and replacement of the video head drum (instructor demonstrated only).

TRAINING OBJECTIVE: Given an analog VTR and a list of features and functions of a digital VTR, appropriate test equipment and monitors, and Manufacturer's technical manual, the student identifies video tape tracks; describes VTR modes of operation and limitations; and explains the similarities and differences of analog and digital VTR formats. Comprehension is measured with written examinations. The student must correctly answer at least 70 percent of the questions for each objective.

REFERENCES: VTR Service Manual
NAB Engineering handbook, Magnetic recording devices
Sony VTR theory

INSTRUCTOR/STUDENT RATIO: 1:8(L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 6
Video Tape Recorders (VTR)

TPFN: DINFOS-BTVEM-006-002-

UNIT TITLE: VTR Maintenance

TPFN TYPE AND HOURS: .5 D; 6.5 PE; 1 EP

TPFN TOTAL HOURS: 8

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Perform VTR maintenance to include operational check/diagnostic check and routine cleaning and lubrication.

TRAINING OBJECTIVE: Given a VTR, an input signal, all appropriate test equipment, and Manufacturer's technical manuals the student performs operations checks, diagnostic checks, routine cleaning, and lubrication. The student also identifies key terms and circuit boards associated with the above tasks, and further explains the steps involved in removing and replacing the video head drum. The student must perform the tasks IAW the Manufacturer's guidelines and with no safety violations.

REFERENCES: VTR Service manual

INSTRUCTOR/STUDENT RATIO: 1:4 (PE, EP, D)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

****NOTE:** The VTR CAI program will be incorporated into the lecture portion of this learning objective. It will also be used as reinforcement training during the hands-on practice time of the class, when there are normally one to four students practicing a performance task and the other students are waiting for their turn to practice.

FUNCTIONAL AREA 6
Video Tape Recorders (VTR)

TPFN: DINFOS-BTVEM-006-003-

UNIT TITLE: VTR Alignments

TPFN TYPE AND HOURS: 2 D; 15 PE; 4 EP

TPFN TOTAL HOURS: 21

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Perform VTR alignments to include servo alignments, video/RF alignments, audio alignments, and mechanical alignments.

TRAINING OBJECTIVE: Given a VTR, all appropriate test equipment, and Manufacturer's technical manuals, the student identifies the signal path through the circuits listed and performs alignments listed. Proficiency of tasks is measured with performance evaluations. The student must perform the alignments IAW the Manufacturer's guidelines with no safety violations.

REFERENCES: VTR Service manual, block diagrams, schematic and alignment procedures
Manufacturer's Manual/Oscilloscope
Manufacturer's Manual/Digital Multimeter
Manufacturer's Manual/Waveform monitor
Manufacturer's Manual/Vectorscope
Manufacturer's Manual/Sync generator

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 6
Video Tape Recorders (VTR)

TPFN: DINFOS-BTVEM-006-004-

UNIT TITLE: VTR Troubleshooting

TPFN TYPE AND HOURS: .5 D; 12.5 PE; 2 EP

TPFN TOTAL HOURS: 15

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Troubleshoot the VTR to include the mechanical system, servo circuits to board level, video/RF circuits to board level, audio circuits to board level, and system control to board level.

TRAINING OBJECTIVE: Given a VTR, all appropriate test equipment, and Manufacturer's technical manual, the student will diagnose faults in the circuits identified above, specifying the faulty circuit card and isolating the probable faulty component(s). Comprehension is measured by performance exercises. The student must perform each troubleshooting exercise without safety violations and with limited instructor assistance.

REFERENCES: VTR Service manual, block diagrams, schematic and alignment procedures
Manufacturer's Manual/Oscilloscope
Manufacturer's Manual/Digital Multimeter
Manufacturer's Manual/Waveform monitor
Manufacturer's Manual/Vectorscope
Manufacturer's Manual/Sync generator

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 7
Studio Systems

TPFN: DINFOS-BTVEM-007-001-

UNIT TITLE: Overview of Studio Systems

TPFN TYPE AND HOURS: 16 L; 2 EW

TPFN TOTAL HOURS: 18

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Identify principles of studio systems to include sync/test signal generator, character generator, video switcher, distribution amplifier, and time base correctors/frame synchronizers.

TRAINING OBJECTIVE: Given a list of various types of TV studios and the essential components within them, the student identifies the differences of those studios; identifies the functions of the essential components within the studios, identifies trends in new digital technology; and compares and contrasts digital and analog systems. Comprehension is measured using written evaluations; the student must correctly answer at least 70 percent of the questions for each objective.

REFERENCES: National Association of Broadcaster 9th edition, pages 116-128
875-888, 927, 953-955
Manufacturer's Manual/Video Switcher
Manufacturer's Manual/Character generator
Manufacturer's Manual/Distribution amplifier
Manufacturer's Manual/Test signal generator
Manufacturer's Manual/Time base corrector/Frame synchronizer
Grass Valley Group, Inc., NTSC Studio Timing: Principles
And Applications

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 7
Studio Systems

TPFN: DINFOS-BTVEM-007-002-

UNIT TITLE: Studio Generators

TPFN TYPE AND HOURS: 1 D; 5 PE; 1 EP

TPFN TOTAL HOURS: 7

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Perform operational checks of sync/test signal generator, character generator, video switcher, distribution amplifier, and time base correctors/frame synchronizers.

TRAINING OBJECTIVE: Given a sync/test signal generator and a character generator in a TV studio environment, Manufacturer's technical manuals, and all appropriate test equipment, the student identifies the functions of each generator, and performs an operations check of each generator. Proficiency of tasks are measured using a performance examination. Operations checks must be performed IAW Manufacturer's guidelines and with no safety violations.

REFERENCES: National Association of Broadcaster 9th edition, pages 875-886
Manufacturer's Manual/Video Switcher
Manufacturer's Manual/Waveform Analyzer
Manufacturer's Manual/Vectorscope
Manufacturer's Manual/Character generator
Manufacturer's Manual/Distribution amplifier
Manufacturer's Manual/Test signal generator
Manufacturer's Manual/Time base corrector/Frame synchronizer
Manufacturer's Manual/Oscilloscope

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 7
Studio Systems

TPFN: DINFOS-BTVEM-007-003-

UNIT TITLE: Alignments

TPFN TYPE AND HOURS: 1.5 D; 6 PE; 1.5 EP

TPFN TOTAL HOURS: 9

PREREQUISITE TPFN: All previous TPFNs

TASK(S):
001 Perform alignments of distribution amplifier.
002 Perform alignments of system timing/phasing.
003 Perform alignments of systems sub-carrier/horizontal phasing.

TRAINING OBJECTIVE: Given a video production studio with input signal and destination equipment, all appropriate test equipment, and the manufacturers' technical manuals, the student performs alignments of distribution amplifiers and timing and phasing adjustments. Proficiency of task s is measured with performance examinations. The student must perform this task IAW the Manufacturer's guidelines with one instructor assist, no safety violations, and without error.

REFERENCES: National Association of Broadcaster 9th Edition, pages 882-885
Manufacturer's Manual/Video Switcher
Manufacturer's Manual/Waveform Analyzer
Manufacturer's Manual/Vectorscope
Manufacturer's Manual/Distribution amplifier
Manufacturer's Manual/Test signal generator
Manufacturer's Manual/Oscilloscope
Manufacturer's Manual/Test signal generator
Manufacturer's Manual/Time Base Corrector

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 7
Studio Systems

TPFN: DINFOS-BTVEM-007-004

UNIT TITLE: Studio Camera Systems Preparation.

TPFN TYPE AND HOURS: .5 D; 6 PE; 1.5 EP

TPFN TOTAL HOURS: 8

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Perform light measurement with photometer, adjust Camera Control Unit (CCU): iris control, master pedestal, black balance, and white balance, and adjust color balance between cameras.

TRAINING OBJECTIVE: Given a TV studio with studio lights, multiple cameras and their CCUs, a photometer, a white chart, all appropriate test equipment, and Manufacturer's technical manuals; the student will properly light the studio, and use the CCUs to set the iris control, master pedestal, black balance, and white balance for each camera. Proficiency is measured with performance examinations. The student must perform each task IAW Manufacturer's guidelines and NTSC standards, with limited instructor assistance and with no safety violations.

REFERENCES: National Association of Broadcaster 9th Edition, pages 833-842, 863-865, 1039-1046
Manufacturer's Manual/Photometer
Manufacturer's Manual/Camera
Manufacturer's Manual/Character generator
Manufacturer's Manual/Test signal generator
Manufacturer's Manual/Time base corrector/Frame synchronizer
Manufacturer's Manual/Video switcher

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 7
Studio Systems

TPFN: DINFOS-BTVEM-007-005-

UNIT TITLE: Application of Studio Skills.

TPFN TYPE AND HOURS: 1 D; 25 PE; 4 EP

TPFN TOTAL HOURS: 30

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Troubleshoot studio system to unit level.

TRAINING OBJECTIVE: Given a TV studio with various component items necessary to provide a final video signal, all appropriate test equipment, and Manufacturer's technical manuals; the student will troubleshoot and identify problems within the designated studio system. The student will be allowed one instructor assist, but must complete the exercise with no errors and no safety violations.

REFERENCES: Manufacturer's Manual/Camera
Manufacturer's Manual/Camera control unit
Manufacturer's Manual/Video switcher
Manufacturer's Manual/waveform analyzer
Manufacturer's Manual/Vectorscope
Manufacturer's Manual/Character generator
Manufacturer's Manual/Distribution amplifier
Manufacturer's Manual/Test signal generator
Manufacturer's Manual/Time base corrector/Frame synchronizer
Manufacturer's Manual/Oscilloscope

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 8
Transmission Systems

TPFN: DINFOS-BTVEM-008-001-

UNIT TITLE: Radio and Television Transmitters

TPFN TYPE AND HOURS: 6 L; 2 EW

TPFN TOTAL HOURS: 8

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Identify the principles of transmission concepts (e.g. block diagrams) antenna systems (e.g. Dipole, Yagi), antenna polarization (vertical, horizontal, circular), radiation patterns, basic installation considerations, and grounding.

TRAINING OBJECTIVE: Given block diagrams and a list of terms, the student will identify the fundamental concepts, principles and characteristics of transmission systems; define various antenna systems, antenna polarization, radiating patterns; and identify procedures for installing and grounding transmission systems. Comprehension is measured by written examination. The student must correctly answer at least 70 percent of the questions on each objective.

REFERENCES: NAB Engineering handbook, 9th Edition, Section 1.1 Electromagnetic Spectrum, pp3-8, Section 1.2, Frequency Allocation for Broadcasting Pp 11-17, Section 2.4, Coaxial Transmission lines pp 245-250, Section Section 4.1, AM Transmitters pp 475-502
NAB, National Radio Systems Committee (NRSC-1) Interim Voluntary National Standards pp 503-512
NAB, National Radio Systems Committee, (NRSC-2 Interim Voluntary National Standards pp 513-523
Principles of Electronic Communication Systems: Frenzel. CH 1 Section 1-5, pp 15-17, 17-23, Section 1-6, pp 23-25, CH 2 Section 2-1, pp 40-51 Section 2-3, pp 69-82, CH 14, pp 630-678 (focus on wave propagation 14-3)
NAB Engineering Handbook, CH 4-1
DoD AFRTS Engineering Standards and Practices handbook, CH 6
In-class handouts and slide presentation

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 8
Transmission Systems

TPFN: DINFOS-BTVEM-008-002-

UNIT TITLE: Cable Head-End Systems

TPFN TYPE AND HOURS: 14 L; 2 D; 2 EW

TPFN TOTAL HOURS: 18

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Identify the principles of cable distribution concepts (e.g. block diagrams),rack assemblies (routing and forming wiring harnesses), cable connectors (F type), video cable (RG type), fiber optics transmission theory, bandpass filters, combiner/mixer, pilot generators, and modulators (radio/TV).

TRAINING OBJECTIVE: Given Manufacturer's technical manuals, including block diagrams, the student will explain the signal path through cable distribution systems; describe correct cable routing and wiring harnesses; identify various cables and cable connectors and their specifications; explain the fundamentals of fiber optic transmission; define bandpass filters, combiners/mixers, pilot generators, and radio/TV modulators. Comprehension is measured by written examination. The student must correctly answer at least 70 percent of the questions on each objective. Competency in this unit is essential to student success, and reinforced in the subsequent performance training units for transmission systems.

REFERENCES: NAB Engineering handbook, 9th Edition, Cable television systems
pp 1339-1363
Principles of Electronic Communication Systems, Frenzel , CH 19-3, CATV
pp 927-933
Student Text, In-class handouts and slide presentation
Section 4.1, AM Transmitters pp 475-502
National Association of Broadcasters Engineering handbook, 9th Edition
Section 2.4, Coaxial Transmission Lines, pp 245-259
Principles of Electronic Communication Systems, Frenzel, CH 13,
Transmission-Line Principles, pp 581-627
AFRTS-BRTSM Student Text, In-class handouts and slide presentation
NAB handbook, 9th Edition, pp 1265-1283, Principles of Electronic
Communication Systems, Frenzel CH 18
Corning Premises Optical Fiber Tutorial
Student Text;
In-class handouts and slide presentation

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 8
Transmission Systems

TPFN: DINFOS-BTVEM-008-003-

UNIT TITLE: Using Test Equipment Associated with Cable Head Ends

TPFN TYPE AND HOURS: 1.5 D; 4.5 PE; 2 EP

TPFN TOTAL HOURS: 8

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Use sweep generator/spectrum analyzer, wattmeter, and time domain reflectometer.

TRAINING OBJECTIVE: Students will use a sweep generator/spectrum analyzer, wattmeter, time domain reflectometer IAW the manufacturer's manual, with no safety violations, and within tolerances as defined on the performance checklist.

REFERENCES: NAB Engineering handbook, 9th Edition, Cable television systems
pp 1339-1363
Principles of Electronic Communication Systems, Frenzel , CH 19-3, CATV
pp 927-933
Student Text, In-class handouts and slide presentation
Section 4.1, AM Transmitters pp 475-502
National Association of Broadcasters Engineering handbook, 9th Edition
Section 2.4, Coaxial Transmission Lines, pp 245-259
Principles of Electronic Communication Systems, Frenzel, CH 13,
Transmission-Line Principles, pp 581-627
AFRTS-BRTSM Student Text, In-class handouts and slide presentation
NAB handbook, 9th Edition, pp 1265-1283,
Principles of Electronic Communication Systems, Frenzel CH 18
Corning Premises Optical Fiber Tutorial
Student Text;
In-class handouts and slide presentation

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 8
Transmission Systems

TPFN: DINFOS-BTVEM-008-004-

UNIT TITLE: Microwave Transmission Systems

TPFN TYPE AND HOURS: 18 L; 2 EW

TPFN TOTAL HOURS: 20

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Identify principles of microwave systems concepts, microwave transmission, and studio to transmitter link.

TRAINING OBJECTIVE: Given Manufacturer's technical manuals, including block diagrams, the student will explain the signal path through selected major circuits of a microwave system, identify characteristics and elements of microwave transmitters, and define various types of studio-transmitter links. Comprehension is measured by a written examination. The student must correctly answer at least 70 percent of the questions on the exam.

REFERENCES: NAB Engineering Handbook, CH 4.5, pp 609-631
Basic Television & Video Systems 6th Edition, CH 1, pp 8 & 9
Electronic Communication Systems, CH 14, pp 670-678
California Microwave Manual, section 2 pp 2-1 thru 2-4

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires and the use of tools and equipment.

FUNCTIONAL AREA 8
Transmission Systems

TPFN: DINFOS-BTVEM-008-005-

UNIT TITLE: Satellite Transmission Systems

TPFN TYPE AND HOURS: 11 L; 2 EW

TPFN TOTAL HOURS: 13

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Identify principles of satellite systems concepts, satellite transmission, data transmission and reception (digital signal characteristics), compression transmission, and receivers/descramblers.

TRAINING OBJECTIVE: Given Manufacturer's technical manuals, including block diagrams, the student will explain the characteristics of a satellite transmission system; trace the signal through a satellite system, explaining the purpose of various circuits within the system; describe the signal characteristics during data transmission and reception; and describe how compression techniques are used in transmitting a signal over a satellite system. Comprehension is measured by written examination. The student must correctly answer at least 70 percent of the questions.

REFERENCES: NAB Engineering handbook, 9th Edition, Section 3.8 Transmission audio processing section 3.9, pp 397-410
Remote news and production, section 6.11, pp 411-431
Satellite earth station and systems section, 6.2-6.5, pp 1285-1322
Television transmitters, multichannel TV sound, TV data Broadcasting and transmission, system control and monitoring, pp 1105-1182
Principles of Electronic Communication Systems, Frenzel, CH 16, pp 757-799
Satellite communication, pp 758-799 CH 19, pp 907-927
AFRTS Broadcast Center Satellite Handbook V.2
Student Text;
In-class handouts and slide presentation

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment

FUNCTIONAL AREA 8
Transmission Systems

TPFN: DINFOS-BTVEM-008-006-

UNIT TITLE: Transmitter Performance Checks and Alignments.

TPFN TYPE AND HOURS: 3.25 D; 5.75 PE; 12 EP

TPFN TOTAL HOURS: 21

PREREQUISITE TPFN: All previous TPFNs

TASK(S):
001 Perform transmitter performance checks.
002 Align exciters.
003 Align antenna-coupling networks.
004 Align RF modulators.
005 Perform field strength measurements.
006 Align power supplies.
007 Align power amplifiers.

TRAINING OBJECTIVE: Given a transmitter, antenna, appropriate test equipment, and Manufacturer's technical manuals, the student will conduct performance checks of a transmitter, and align the transmitter and antenna components listed above. Proficiency is measured by performance examinations. The student must perform the checks and alignments IAW Manufacturer's guidelines, with no safety violations, and with minimal instructor supervision/assists.

REFERENCES: Manufacturer's Manual/Multimeter
Transmitter rack assembly

INSTRUCTOR/STUDENT RATIO: 1: 8 (D) 1:4 (PE EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 8
Transmission Systems

TPFN: DINFOS-BTVEM-008-007-

UNIT TITLE: Transmitter Troubleshooting

TPFN TYPE AND HOURS: 2 D; 3 PE; 3 EP

TPFN TOTAL HOURS: 8

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001 Troubleshoot transmitter to component level.

TRAINING OBJECTIVE: Given a transmitter, appropriate test equipment, and Manufacturer's technical manuals, the student will troubleshoot the transmitter. Proficiency is measured by performance examination. The student must identify the fault down to the module level IAW Manufacturer's guidelines, without error or safety violations.

REFERENCES: Transmitter Service manual block diagrams and schematic
Manufacturer's Manual/Audio signal generator
Manufacturer's Manual/Oscilloscope
Manufacturer's Manual/Multimeter
Manufacturer's Manual/Dummy load
Manufacturer's Manual/20db Attenuator
Manufacturer's Manual/Wattmeter
Manufacturer's Manual/Modulation monitor

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must follow all safety precautions pertaining to electrical shock, burns, fires, and the use of tools and equipment.

FUNCTIONAL AREA 9
Field Training Exercise (FTX)

TPFN: DINFOS-BTVEM-009-001-

UNIT TITLE: Broadcast Communication Links

TPFN HOURS AND TYPE: 2.5 D; 16.5 PE; 5 EP

TPFN TOTAL HOURS: 24

PREREQUISITE TPFN: All previous TPFNs

TASK(S):
001 Perform mobile transmitter set up and operational check.
002 Perform microwave dish alignments.
003 Perform satellite acquisition.
004 Perform troubleshooting procedures on microwave systems to unit level.
005 Perform troubleshooting procedures on satellite systems to unit level.

TRAINING OBJECTIVE: In a field environment, and given a microwave transmission system and a satellite transmission system, each with its own dish antenna, feedhorn, low-noise amplifier, and receiver decoder; all appropriate test equipment, Manufacturer's technical manuals; the student will align the microwave dish, acquire a satellite-based signal, perform field strength measurements, and troubleshoot each system down to the unit level. Proficiency is measured by performance examination. All procedures will be done IAW manufacturer's guidelines, and safety protocols.

REFERENCES:
Manufacturer's Manual/Microwave transmitter
Manufacturer's Manual/Microwave receiver
Manufacturer's Manual/TV transmitter
Manufacturer's Manual/FM transmitter
Manufacturer's Manual/Wattmeter
Manufacturer's Manual/Router/Switcher
Manufacturer's Manual/Waveform monitor
Manufacturer's Manual/Vectorscope
Manufacturer's Manual/Audio signal generator
Manufacturer's Manual/Video signal generator
Manufacturer's Manual/AV monitor
Manufacturer's Manual/Parabolic dish
Manufacturer's Manual/Distribution amplifier
Manufacturer's Manual/Multimeter
Manufacturer's Manual/Patch panel

INSTRUCTOR/STUDENT RATIO: 1:4 (D, PE, EP)

SAFETY FACTORS: Students must observe all safety precautions concerning the proper use of tools, equipment, and vehicles.

FUNCTIONAL AREA 10
Course Administration

TPFN: DINFOS-BTVEM-010-001-

UNIT TITLE: Course Administration

TPFN HOURS AND TYPE: 15 AD

TPFN TOTAL HOURS: 15

PREREQUISITE TPFN: N/A

TASK(S):
001 In-processing/orientation
002 Conduct mid-course critique.
003 Course critique.
004 Out-processing/graduation.

TRAINING OBJECTIVE: Self-explanatory.

REFERENCES: DINFOS Policy and Procedures Manual

INSTRUCTOR/STUDENT RATIO: 1:8 (AD)

SAFETY FACTORS: N/A